

**The effects of the Fukushima disaster on nuclear energy debates and policies:
A two-step comparative examination**

Luca Bernardi (School of History, Politics and International Relations, University of Leicester, UK)

Laura Morales (School of History, Politics and International Relations, University of Leicester, UK)

Maarja Lühiste (School of Geography, Politics and Sociology, Newcastle University, UK)

Daniel Bischof (Department of Political Science, University of Zurich, Switzerland)

**(Authors' version submitted to Environmental Politics and accepted by the journal on
13 September, 2017, prior to any copy-editing by the publishers. The published version
produced by the journal can be found on
<http://dx.doi.org/10.1080/09644016.2017.1383007>)**

Abstract: Under what conditions do critical events trigger large-scale public discussion and mobilisation, and can these lead to policy change? In a comparative study of nuclear energy policy after the Japanese Fukushima disaster in March 2011, a theory-development approach is adopted, mobilising data collected from national news agencies' newswires, public surveys, legislation and parliamentary databases, and newspaper editorials in 12 established democracies between March 2011 and March 2013. The analysis suggests two main hypotheses that can guide future research: critical events are more likely to trigger policy change when intense (contentious) mobilisation from policy challengers aligns with the views of the general public, and is backed by major political allies; and critical events are more likely to trigger intense (contentious) mobilisation when policy challengers articulate their opposition around pre-existing policy debates on the issue, and resort to pre-existing organisational and mobilisation resources.

Acknowledgements: The research leading to these results has received funding from the European Research Council through a Starting Grant (Grant Agreement 284277) to the ResponsiveGov Project (<http://www.responsivegov.eu/>), under the EU Seventh Framework Programme. The authors are grateful for this funding. The funder bears no responsibility for the analysis or interpretation of the data presented here. Earlier versions were presented at several conferences and events. The authors are thankful for all comments and feedback received from participants. They also thank Anton Severin and Marjorie Glas for coding assistance on the Swedish and French cases, and the two anonymous reviewers and the journal's editor whose very useful and constructive comments significantly improved the text.

The effects of the Fukushima disaster on nuclear energy debates and policies: A two-step comparative examination

Introduction

Before the nuclear accident in Fukushima, Japan, in 2011, public opinion polls showed increasing acceptance of nuclear power (Pidgeon et al. 2008: 72). Nuclear energy was increasingly depicted as 'green' and pitched as the solution to global climate change, especially in the United States and Canada (Culley et al. 2010; Duffy 2011). However, after the Fukushima incident, several European governments reconsidered their position towards nuclear power. In Germany, seven reactors were shut down immediately for three months and, later, it was decided that the whole nuclear programme should be phased out by 2022 (Jahn and Korolczuk 2012; Meyer and Schoen 2017). The Italian government decided in May 2011 to reverse its previous decision to restart the nuclear energy programme. In Switzerland, parliament decided in June 2011 not to replace reactors and to phase out nuclear energy by around 2034. Nonetheless, in many countries the accident in Fukushima stirred very little political debate and failed to trigger a policy change.

In light of these observations, we question how a critical event can shape political mobilisation and debates, thereby shaping policy decisions. We study the case of nuclear energy policy after the Fukushima disaster with the aim of teasing out the interconnections between political opportunities and the political processes that ensue after a critical event and, occasionally, lead to major policy change. A critical event is defined as an unexpected event — sometimes also called a 'shock' — that triggers an increase in policymakers' attention to a given issue and might have consequences for policy-making. Critical events, such as accidents, are thought to affect the tactical opportunities that movements face (Staggenborg 1993), and major policy change often requires an external perturbation (Baumgartner and Jones 1993; Sabatier and Jenkins-Smith 1999; Birkland and DeYoung 2013).

Interestingly, although scholarship on government responsiveness has focused on how public opinion shifts affect policy change (Manza et al. 2002), less attention has been paid to how and through which mechanisms critical events influence policy change. While a number of studies have examined how major nuclear accidents (Three Mile Island, Chernobyl, and

Fukushima) have influenced public opinion on nuclear energy (Eiser et al. 1989; Verplanken 1989; Lindell and Perry 1990; Bolsen and Cook 2008; Visschers and Wallquist 2013; Siegrist et al. 2014; Latré et al. 2017), limited research has focused on whether and how this change in public opinion influenced government policy (but see, e.g., Birkland 1997; Flam 1994b).

Drawing on scholarship on social movements and policy responsiveness, our core argument is that a critical event opens a window of opportunity for large-scale opinion and protest mobilisation, which social movements may or may not take up efficiently, and this uptake, in turn, influences the possibilities for policy change. We thus propose analysing the link between critical events and policy change as a two-step process. As a first step, contextual factors and political opportunities shape the likely effect that a critical event may have on the opinions and mobilisation of the public. In particular, prior mobilisation on the issue shapes the ability to use the opportunity window offered by an external perturbation to intensify mobilisation. In a second step, the effect of mobilisation on policy change will be shaped by a range of contextual factors and political opportunities, such as the scale and intensity of contentious collective action, the consistency between collective action and public opinion, the degree of countermobilisation by other actors, and the siding of political allies.

To illustrate and refine this two-step approach to the link between critical events and policy change, we examine the sequence of events that followed the nuclear accident in Fukushima. We rely on a novel dataset, which records public debates on the nuclear energy issue on a daily basis between March 2011 and March 2013 in 12 countries: Belgium, Canada, Finland, France, Germany, Italy, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and the United States. By following a theory-development process-tracing strategy (Beach and Pedersen 2013), our goal is not to test a theory of policy change but rather to contribute to theory-development and formulate hypotheses that may be tested in future research. Our data suggest that, in countries where favourable political opportunities and contextual factors were present before Fukushima, large-scale protests indeed had an impact on short-term policy changes. Only on the rare occasions when challenger actors can count on *both* considerable prior mobilisation experience *and* favourable political opportunities can a critical event provide a sufficient window of opportunity to trigger a responsive change in policy.

How do critical events affect public opinion and mobilisation?

Critical events can affect public opinion and mobilisation directly and indirectly. They increase public grievances and public attention to the issue influenced by an event, but more importantly, they can make authorities more receptive to movement demands, thus affecting movements' tactical and political opportunities (Staggenborg 1993: 321). Past research indicates that large-scale nuclear accidents — as one type of critical event — can alter the public's acceptance of nuclear power. However, the existence of a direct link between the critical event (the nuclear accident) and mobilisation around nuclear energy is less clear. In his study of collective action in relation to nuclear accidents, Gamson (1988) argued that the impact of a critical event was affected by prior organising. A movement that had previously built both information and mobilisation infrastructures was better positioned to make the most of a critical event. Similarly, in his study of mobilisation after the Three Mile Island nuclear accident in Pennsylvania in 1979, Walsh (1981) found that the strength and orientation of groups before the accident, in combination with public grievances, explained differential responses. Relatedly, Koopmans and Duyvendak (1995) argued that whether the Chernobyl catastrophe of 1986 triggered a change in the public mood and/or increased anti-nuclear protest activity depended largely on the domestic political climate with which the accident coincided.

Overall, past research suggests that a critical event only triggers increased mobilisation when the political context contributes to the opening of the political space for social movements' actions, which subsequently can help them influence policy. Political opportunity approaches (e.g., Kriesi et al. 1995; McAdam 1996) are therefore important to understand the long-term strategies of anti-nuclear movements (e.g., Kitschelt 1986, Flam 1994b), but they are also key in accounting for the capacity to seize the immediate opportunity that a nuclear catastrophe brings for promoting their anti-nuclear message amongst both the masses and political elites (e.g., Koopmans and Duyvendak 1995; Midttun and Rucht 1994; Ho 2014).

However, the range of factors considered to affect social movement success in the field of political opportunity studies (see, e.g., Meyer 2004) has grown over time, leading to little consensus on what this 'umbrella' concept means and what it can (and cannot) explain. Here, we shift the focus from long-term stable features of the political context to the short-term conjunctural opportunities that are likely to affect the possibilities for challenging a policy immediately after a critical event. We thus identify four main elements that, as we theorise

below, are likely to be critical because they shape the ability to mount a credible challenge to the policy status quo: the presence or absence of a political consensus around the given issue among the political elites, whether the critical event coincides with an ongoing policy debate around the given issue, the prior distribution of public preferences and views around the issue, and the prior levels of contentious mobilisation around the issue. As such, we focus both on the political elites and the masses when considering the factors affecting the ways in which critical events can trigger policy change.

Unsurprisingly, the salience and contentiousness of the nuclear energy issue increased after Fukushima, (re-)opening questions about the safety and usefulness of nuclear power. We argue that this critical event was a driving force that reactivated underlying attitudes – both amongst political elites and the general public — that had been shaped by past similar critical events. Indeed, the post-Chernobyl scenario offers substantial variation in changes in public opinion, with countries such as Germany, Italy, Switzerland, and the United Kingdom becoming more anti-nuclear, while France and Belgium became more pro-nuclear. But it also varied in terms of mobilisation, as anti-nuclear protests increased in Germany and Switzerland (where parties were divided on the subject of nuclear energy and anti-nuclear movements had mobilised the public even before Chernobyl) whereas no significant change occurred in France or the Netherlands (Koopmans and Duyvendak 1995, various chapters in Flam 1994a). Thus, the political opportunities for capitalising on the critical event differed substantially across the contexts, directly affecting the extent of popular mobilisation.

We argue that the Fukushima accident served as a trigger that activated — rather than transformed — latent attitudes towards nuclear energy as well as dormant mobilising resources in the anti-nuclear movement. Thus, we examine whether and how public opinion shifted and protest mobilisation varied in line with the following political opportunities: prior anti-nuclear sentiment, prior anti-nuclear mobilisation after Chernobyl, the position of major parties (with government potential) on nuclear energy, and the presence of an ongoing policy debate about either phasing-in or phasing-out nuclear energy.

How do critical events affect policy?

The record of evidence on the link between critical events, public mobilisation, and policy reactions is mixed (Flam 1994a; Koopmans and Duyvendak 1995; Kolb 2007; Franchino 2014). While scholarship suggests a connection between the structural features of political opportunities, it is less clear about the effect of the specific window of political opportunities that a critical event opens. For example, policy changes following mobilisation campaigns are more likely in polities with highly open political input structures and with strong implementation capacities in the political output structures (Kitschelt 1986; Kriesi et al. 1995).

Equally, it is unclear whether the opportunities that a critical event might bring for heightened mobilisation are consequential. Social movement scholars have attributed the success and failure of movement and protest mobilisation to more structural political opportunities rather than to the scale and intensity of protest. In particular, Kitschelt (1986: 72) argues that ‘we should not expect policy impacts to be attributable to the overall scale and intensity of protest but rather to vary, within limits, independently of them’. This expectation is largely supported by comparative research showing that the influence of protest on policy outcomes is limited (e.g., Giugni 2004, 2007) or moderate at best (Burstein and Linton 2002), and it is likely to dissipate when public opinion is included in the picture. According to this logic, the strength of the mobilisation against nuclear energy after the Fukushima accident should not on its own be expected to affect policy change.

Indeed, some have argued that the impact of protesting minorities is conditional on the views of the silent masses – public opinion. Changes in public opinion might have a stronger effect on governmental actions if they are accompanied by consistent protests (Agnone (2007: 1597). This Agnone calls the ‘amplification’ mechanism; on certain issues, the subdued masses need the support of ‘noisy’ protesters to make themselves heard. In a sense, we could view protesters as the vocal segment of an ‘issue public’ (Krosnick 1990). The amplification effect thus will depend on how large the issue public is to start with, and whether the general public converges with the positions of the issue public and with the importance attributed to the issue.

Consistent with these arguments, research on policy congruence and responsiveness suggests that governments strategically adjust their policies to voters’ preferences and demands in

situations of possible vote loss (e.g., Page 1978; Hobolt and Klemmensen 2008). How much governments react to changes in policy demands will depend on their anticipation of voters' electoral punishment (Soroka and Wlezien 2010), and voters are more likely to punish unresponsiveness or poor performance on issues they care about. As a consequence, we should not expect governments to pay much attention to demands on issues that the public cares little about (Page and Shapiro 1983) or on which the views of the public are divided or unclear. The scale and intensity of a protest is one signal that governments might use to learn about how much the public cares about an issue, and the consistency with the views of the public at large will signal whether voters are cohesively expressing a clear opinion that might result in an electoral loss if the message is ignored (see Gillion 2012). Therefore, we should only expect governments that face simultaneous large-scale anti-nuclear public debate and protest activity to change their policy in an anti-nuclear direction.

However, the low-voiced masses and 'noisy' issue publics need at least some of the political elites on their side. These amplification mechanisms depend on the availability of political allies, who need to be credible but not necessarily in government (Giugni 2004; 2007: 54). They need to provide incentives for the government to react in favour of those mobilising against the government's preferred policy by stirring a perception of vulnerability in future elections. This leads us to focus on the stance that opposition parties take after the critical event, but also on other institutional actors (e.g., subnational governments) and the media. The articulation and mobilising strength of the alternative position on the issue (here, the pro-nuclear position of the energy industry) are also important, as they compete for the support of the potential allies. As a result, studying in detail the interplay between mobilisation, countermobilisation, and political alliances (Flam 1994b; Meyer and Staggenborg 1996) is crucial for understanding when governments will change their policy after a critical event.

Based on the discussion above, we examine how policy change after Fukushima was shaped by: the intensity and scale of anti-nuclear public debates and protest activities, along with their consistency with the views of the general public on nuclear energy; the stance taken by potential allies (the opposition, other institutional actors, and/or the media) in the nuclear energy debate following the accident; and the countermobilisation and strength of the nuclear energy industry and its allies. In so doing, we seek to contribute to theory development around the political processes and dynamics that intervene in shaping the effect a critical

event can eventually have on public policy. Figure 1 summarises the two-step process model that underpins our empirical analysis.

<Figure 1 about here>

Data and methods

Our primary interest is to disentangle the possible interconnections between political opportunities and political processes that followed the Fukushima accident in order to understand what factors might lead to policy change after a critical event. We do so by employing a thick-description and process-tracing theory-development approach that is deployed following the two-step process model depicted in Figure 1. Thus, we are interested in tracing the processes that lead to mobilisation as a first step towards understanding which processes may lead to change in policy.

Process-tracing generally involves ‘attempts to identify the intervening causal process – the causal chain and causal mechanism – between an independent variable (or variables) and the outcome of the dependent variable’ (George and Bennett 2005: 206-7). Given our purposes, we use an approach that is similar to what Beach and Pedersen (2013) called ‘theory-building process-tracing’. Such a strategy can be used ‘when we know an outcome (Y) but are unsure about its causes’ (Beach and Pedersen 2013: 16), and the approach differs from the ‘explaining-outcome process-tracing’ method in important ways. While the latter ‘focuses on building a minimally sufficient explanation of the outcome in an individual case’, the former ‘seeks to build a midrange theory describing a causal mechanism that is generalizable outside of the individual case to a bounded context’ (Beach and Pedersen 2013: 16). The key difference between the original theory-building process-tracing method and our use of it is that the former is meant to be purely inductive, whereas we aim at further developing and specifying existing theoretical approaches guided by the arguments put forward by scholars studying social movement and policy responsiveness. Still, our goal is the same, as we intend to use this approach to formulate hypotheses that can be more systematically tested in future studies.

We focus on established Western democracies only, and our unit of analysis is a country. We do not include Central and Eastern European (CEE) countries because our examination of

prior anti-nuclear mobilisation relies primarily on accounts of protest and public opinion in the immediate aftermath of the Chernobyl accident. Although CEE countries experienced environmental mobilisation after Chernobyl and this critical event helped catalyse the environmental movement in the region, the accident happened when these countries had state socialist regimes, and both democratic opposition rights and access to information about the accident were severely curtailed (Carmin and Fagan 2010). We also only consider countries where, by 2011, nuclear energy was produced and/or where there was a debate, prior to the Fukushima accident, about using nuclear energy in the near future. Our study thus includes 12 Western democracies, of which 11 (Belgium, Canada, Finland, France, Germany, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and the United States) were producing nuclear energy in 2011 and one (Italy) was actively debating nuclear energy production (Kriesi 2017; Aarts and Arentsen 2017; Swyngedouw 2015; Bern and Winkel 2013; World Nuclear Association 2014; ResponsiveGov project data collection).

The majority of our data comes from the manual coding of the content of the (main) national news agencies' newswires in each country, complemented with exhaustive and systematic searches in opinion poll sources, legislation databases, and parliamentary archives (see Lühiste et al. 2017 for details on all sources and the codebook). For each country, we determine the initial policy positions by assigning a score for each government on an ordinal scale from -2 (very anti-nuclear) to +2 (very pro-nuclear) depending on the government's position, as expressed in the coalition agreement (for coalition governments) or in party manifestos (for single party governments) for the elections prior to the Fukushima accident (see Online Appendix for information about the coding categories). Using the same coding categories, we also code the government's final policy position at the end of the policy case period, which is normally 31 March 2013.¹ However, if the government reacted substantively (e.g., with a U-turn) before 31 March 2013, the date of that policy shift by the government marks the end of data collection; or if general elections took place a minimum of six months after 11 March 2011, the date of the general elections marks the end of the coding period. The final position is established by the coder — and supervised by the core research team — based on the statements on nuclear energy made by the government as captured through the newswires and in legislative/government documents during the coding period.

¹ This date was chosen because data collection started in April 2013 and it was essential to establish a cut-off date (when all cases would end) as a common censoring date.

At the time when the Fukushima nuclear accident occurred, only two of the 12 national governments' initial policy positions were considered anti-nuclear: Belgium and Spain (the only countries with clear nuclear phase-out policies; see Table 1). By the end of the coding period, four governments are classified as having an anti-nuclear energy policy position: Germany, Italy, Switzerland, and Spain. While Spain retains the same policy position, the former three governments made a U-turn on nuclear energy policy following the Fukushima accident. However, Belgium made the opposite U-turn from an anti-nuclear governmental policy position to a more pro-nuclear governmental policy position, as it reversed prior phase-out plans by implementing a considerable delay. All the other national governments considered here held, to a greater or lesser extent, pro-nuclear policy positions both before and after Fukushima.

We also collected data on interim changes in these government policy positions (if any) and on the multiple types of expressions of views, preferences, and demands on nuclear energy from a range of social and political actors for the same period. Assisted by a detailed dictionary of relevant keywords to detect the relevant pieces, we manually coded all news stories in national press agencies' newswires relating to nuclear energy policy, all survey reports in which public opinion about nuclear energy policies are presented, all parliamentary question and answer sessions and changes in legislative acts relating to nuclear energy, and all editorials discussing nuclear energy policies in one 'progressive' and one 'conservative' broadsheet newspaper in each country (Lühiste et al. 2017).

<Table 1 about here>

The unit of coding is an *event*: a claim, declaration, report, or action. We coded various events, including interviews, speeches, policy proposals, parliamentary debates, court rulings, blog posts reported, referenda, elections, demonstrations, and boycotts (Lühiste et al. 2017). For each event, up to three *actors* and their policy positions were coded in relation to the government's initial policy position. An actor can be both an individual and/or an institution/organisation. Each actor's policy position was coded in relation to the government's initial policy position. An actor's position can be radically more anti-nuclear (-

2), slightly more anti-nuclear (-1), the same (0), slightly more pro-nuclear (1), or radically more pro-nuclear (2) than the government's initial policy position. In order to summarise whether different sets of actors hold anti-nuclear or pro-nuclear views, irrespective of the initial government position, actors' positions were recoded from a relative scale to an absolute scale (see Online Appendix for details).²

Following our theory-development process-tracing approach, our analysis aims at providing a thick description of how events, political debates, and policy reactions unfolded. For this reason, all the data analyses are primarily descriptive and we do not deploy hypothesis-testing multivariate analyses, either quantitative or qualitative. Instead, we provide a thorough comparative description of how the specific window of political opportunities provided by the Fukushima accident, prior patterns of public sentiment and protest mobilisation, posterior patterns of mobilisation and countermobilisation, and their alignment with the silent majority and with key political allies interact in each of these 12 cases to lead to the final outcomes observed. We then examine the patterns of interaction between these various factors and consider whether they suggest a causal process that may lead to the presence or absence of policy change.

The context prior to the Fukushima disaster

We first provide a very brief overview of the context before Fukushima. The 12 countries under examination differ significantly concerning the range of political opportunities expected to intervene in the intensity and following of anti-nuclear mobilisation (see an overview in Müller and Thurner 2017). The conditions for large-scale anti-nuclear mobilisation were ideal in Italy and Germany, as the majority of the public in both countries was clearly against nuclear energy (Eurobarometer 2011), both countries had experienced large-scale anti-nuclear protests after the Chernobyl accident (Kolb 2007; Kousis et al. 2008: 1632), some major political parties opposed nuclear energy, and there was an active ongoing phasing-in (Italy) and phasing-out (Germany) debate taking place in both countries (Jahn and Korolczuk 2012).

² The Krippendorff Alpha values for the inter-coder reliability tests for the main variables are: Type of event (0.82), Number of protest participants (0.95), Type of actor specific (0.81), Policy position relative to government (0.89), and Direction and intensity of position (0.81). Details are reported in the Online Appendix.

Some of the favourable opportunities for anti-nuclear mobilisation were present in Spain and Belgium, where nuclear energy phase-out plans were in place before Fukushima. Yet both countries were considering modifying these plans. The Belgian coalition government tried to reverse the phase-out decision but did not manage to bring a bill to parliament before the Fukushima accident due to a government crisis (Swyngedouw 2015: 3). Spain decided to stop the construction of any new plants in 1983 and also had a phase-out plan, with the last reactor due to close in 2018, yet this plan was altered under the second Zapatero cabinet in February 2011. The majority of the main left-wing and Green parties in Belgium and Spain were supportive of nuclear phase-out policies. Additionally, the majority of Spaniards were against the use of nuclear energy (Eurobarometer 2011). However, in Spain anti-nuclear mobilisation after the 1986 Chernobyl accident was less successful than in Italy or the Netherlands; in the following three years two new reactors were connected (Franchino 2014).

Before Fukushima, the Swiss were also actively debating the merits and disadvantages of nuclear power and the government was actively planning to replace three nuclear power reactors (Siegrist and Visschers 2013). Though the major Swiss parties (except the Greens) were pro-nuclear, the anti-nuclear movement had considerable experience in mobilising large portions of the public, whose anti-nuclear majority had considerably increased immediately after Chernobyl (Koopmans and Duyvendak 1995).

In Canada (Fried and Eyles 2011; Bratt 2005), the Netherlands (de Groot and Steg 2010), and Finland, only one of the four favourable conditions – some political opposition to nuclear power – was present before Fukushima. In contrast, none of the four favourable political opportunities was present in the remaining four countries: France (Brouard et al. 2013; Brouard and Guinaudeau 2014), Sweden (Nohrstedt 2009), the United Kingdom (Pidgeon et al. 2008), and the United States.

The dynamics of public debate and mobilisation on nuclear energy after Fukushima

How much attention and public debate did the nuclear disaster in Fukushima trigger in these 12 countries? Figure 2 summarises the total number of events per month in each country over the entire period studied. In all countries, the highest number of events occurred during the first month (March 2011) following the Fukushima accident. Naturally, verbal statements constitute the most common type of event, but meetings and debates are also fairly common,

reflecting the organisation of parliamentary deliberations and meetings on nuclear safety. Countries with the liveliest debate are also those where political decisions concerning nuclear energy were more commonly adopted, especially during the first months after Fukushima.³

<Figure 2 about here>

Countries with the most favourable political opportunities are, in general terms, more likely to display more intense debates. In Germany and Italy, more than 500 events happened during March 2011 alone. Nuclear energy also attracted considerable attention in Spain (192 events) and Switzerland (130 events) in that first month. Contrary to expectations, nuclear energy was also heatedly debated in France (186 events in March 2011), despite the traditionally more cohesive pro-nuclear stance of the leading parties. A large number of events (138 in March 2011) were also tracked in the United States, but most relate to nuclear safety rather than nuclear energy policy. Given the relatively unfavourable political opportunities in Canada, Finland, the Netherlands, Sweden, and the United Kingdom, it is unsurprising that relatively little debate was tracked in these countries after Fukushima.

Although at least one of the government parties in Belgium and Finland was against nuclear energy and there were government coalition negotiations taking place shortly after Fukushima (March-December 2011 and April-June 2011, respectively), there was little public mobilisation. While the Green parties in these two countries tried to include nuclear energy policy in the coalition agreement discussions, the negotiations had a limited impact on the intensity of public debate around the issue. There were also large cross-national differences in the number of protest events reported. Protests were more frequent during the first few months in Germany, Italy, France, Spain, and Switzerland than in the remaining seven countries, and these were also the countries with intense involvement of collective action actors (e.g., anti-nuclear civil society organisations and social movements). Given the nature of the issue, nearly all protests were advocating anti-nuclear positions. The pro-nuclear side primarily expressed their views and demands through statements and meetings. The few exceptions were small-scale protest actions by workers at nuclear plants in France that voiced pro-nuclear stances.

³ A detailed graph by type of event is reported in Figure A1 in the Online Appendix.

Table 2 summarises the number of protest events and the total number of participants (per million inhabitants) recorded by country. These figures show that countries where anti-nuclear mobilisation was high following Chernobyl — Germany, Italy, and Switzerland — (Koopmans and Duyvendak 1995) are also those where proportionally larger numbers of people mobilised against nuclear energy after Fukushima. France and Spain are exceptions to this pattern and differ in one important way from the other three: while the total number of protest events is large in these two countries, the maximum relative turnout at any single protest event is relatively low. Hence, French and Spanish protesters, unlike their German, Swiss, and Italian counterparts, never reached a ‘critical mass’ at any given protest event. The data also show that where fewer protest events took place after Fukushima, such events tended to be more confrontational. In most countries, confrontational protests involved a small number of Greenpeace or other anti-nuclear organisation activists who either tried to disrupt nuclear waste transportation or to enter nuclear power plants.

<Table 2 about here>

The question thus arises as to whether the positions of the general public were consistent with protesters’ demands. Figure 3 depicts the change in public opinion, as measured through surveys, after Fukushima.⁴ Before Fukushima (horizontal axis), public opinion was already significantly anti-nuclear in Germany, Spain, and Italy (countries to the right of the red vertical line), while after Fukushima (vertical axis), the general public held clearly anti-nuclear views also in Belgium and Switzerland (countries above the red horizontal line).

⁴ Where available, the following survey question (with minor variations) was used for Figure 3: ‘Please tell me whether you strongly support, somewhat support, somewhat oppose, or strongly oppose each way of producing electricity. What about nuclear energy?’ Responses that indicate support for nuclear energy (‘strongly support’ + ‘somewhat support’) were used for calculating the share of population in favour of nuclear energy. In the cases of Belgium, Sweden, and Switzerland, a different survey question was used to measure support for nuclear energy before Fukushima: ‘In your opinion, should the current level of nuclear energy as a proportion of all energy sources be reduced, maintained the same, or increased?’ Responses that indicate support for nuclear energy (‘maintained the same’ + ‘increased’) were used for calculating the percentage in favour of nuclear energy.

Hence, in these five countries the anti-nuclear movement benefitted from having public opinion ‘on their side’. Although Finland, the Netherlands, and France also witnessed some protest activity (see Table 2), public sentiment in these countries was and remained pro-nuclear.

The dashed diagonal line in Figure 3 serves to indicate the countries where the public became either more or less anti-nuclear following Fukushima. The closer the country point is to the dashed line, the less public opinion on nuclear energy changed as a result of the Fukushima disaster. Interestingly, in many countries public sentiment was not affected much by Fukushima. However, it became significantly more anti-nuclear in Belgium, Italy, Switzerland, the United Kingdom, and the United States, although in the latter country the majority of the public remained favourable to nuclear energy.

<Figure 3 about here>

As we discussed earlier, which side the various political and institutional actors took after the critical event is thought to be important, and so is the degree of countermobilisation by the opposite side in the conflict. Thus, we examine the direction of preferences expressed in the events by the various actors involved. Germany, Spain, and Belgium are the only countries where all types of actors, except for the nuclear industry, took anti-nuclear positions more often than pro-nuclear ones (see Figure 4). Hence, in these countries, anti-nuclear mobilisations were supported by several political allies. In contrast, in Finland,⁵ Canada, the United Kingdom, and the United States,⁶ most or all types of actors, except for collective action and public sphere actors, displayed mostly pro-nuclear positions. Thus, in these countries anti-nuclear protesters had few (if any) allies among institutional actors.

In the remaining countries, there was limited public consensus concerning nuclear energy and, interestingly, national opposition actors took primarily anti-nuclear positions while national governments — typically centre-right — expressed pro-nuclear preferences. These

⁵ The Finnish Green party (in national government) campaigned for the government not to issue any new permit for the building of nuclear plants. However, most statements made by the Green party are considered pro-nuclear because they did not demand an overall nuclear phase-out.

⁶ Most statements of civil society actors in the United States were only considered slightly more anti-nuclear than the US government’s initial policy position on nuclear energy and so are classified as pro-nuclear.

governments' pro-nuclear positions are in line with previous scholarship that suggests that both political elites and the general public who hold right-of-centre views take a more pro-nuclear energy stance (Kuklinski et al. 1982; Rothman and Lichter 1987; Plutzer et al. 1998).

<Figure 4 about here>

Yet, in order for political allies to be effective, their opposition to government policy needs to be sustained over time, and in Figure 5 we show the extent to which this was the case after Fukushima. As Green parties can be considered to own the anti-nuclear issue position, and are by default political allies of the anti-nuclear movements (except the lukewarm Finnish Greens), we excluded them from the analysis.

<Figure 5 about here>

Shortly after the accident, the majority of statements made by Belgian, German, and Spanish parties were against nuclear energy. While the Spanish and German governments and opposition parties remained largely anti-nuclear, the Belgian parties (except the Greens) became pro-nuclear over time. In Switzerland and Italy the opposition parties were against nuclear energy from the start, while government parties became gradually more anti-nuclear. Despite the fact that the Swedish opposition parties were consistently anti-nuclear, the governing parties sustained their endorsement of nuclear energy. For Canada, Finland, France, the United Kingdom, and the United States, Figure 5 confirms the results of Figure 4: the anti-nuclear movement finds little support in the major political parties, other than the Greens. Thus, only in a few countries did those mobilising against nuclear energy find the sustained and active support of a broad range of political allies.

Tracing the impact of the public debate and mobilisation on nuclear energy policy after Fukushima

Our findings show considerable cross-national variation in the extent and nature of the public debate and mobilisation around nuclear energy after Fukushima. But what effect, if any, did

they have on governmental nuclear energy policy? Following our theoretical discussion of the two-step approach to policy change after a critical event, we should only expect a policy change yielding to pressure from the public after a critical event when favourable pre-existing political opportunities offer policy challengers a window of opportunity that they can efficiently use to mobilise their support groups, and intense mobilisation aligns with public support and the mobilisation of strategic political allies. How did the patterns and dynamics uncovered by our analysis conform to these expectations?

Table 3 outlines the absence and presence of favourable political opportunities for policy change before (section 3A) and after Fukushima (section 3B). Only in five countries – Belgium, Germany, Italy, Spain, and Switzerland – are two or more conditions fully met. All criteria are fulfilled in Italy, while in Germany, Switzerland, and Belgium three conditions out of four are fully met. Perhaps unsurprisingly, the Italian government decided to reverse its nuclear energy policy: the public was vocally against nuclear energy and took their demands to the streets. Furthermore, the nuclear industry lobby remained relatively silent, at least as recorded by the media. Despite the fact that the nuclear industry was quite vocal in Germany and, especially, in Switzerland (see Figure 4), nuclear energy policy was radically changed in these two countries as governments agreed to phase-out plans. Thus the three countries that witnessed the largest anti-nuclear mobilisations are also the countries in which a policy change towards anti-nuclear positions happened. Indeed, even if the U-turn was less costly in the Italian case because the nuclear programme was only recently re-launched, this was not the case in Germany and Switzerland, where 28% and 38%, respectively, of energy production came from nuclear power. Thus, these findings suggest that protests and their magnitude may matter and, indeed, be a key factor.

<Table 3 about here>

This argument is further strengthened because Belgium, where most of the conditions were fulfilled except for large-scale protests, was the one country that decided to reverse the nuclear phase-out policy. Nevertheless, the Belgian government reversed its policy towards a pro-nuclear position more than one year after Fukushima, and when the Green parties that adopted the 2003 phase-out plan were no longer included in the governing coalition, and hence were less influential political allies of the little-supported anti-nuclear movement.

Undoubtedly, Belgium's heavy reliance on nuclear power was the underlying motivation for this policy reversal, but it remains an open question whether the Belgian government could have backtracked on its original phase-out commitment had anti-nuclear mobilisation been intense and sustained.

In other countries where the public debate was significant but less intense, such as France and Spain, one or several favourable conditions for policy change were not fully met. In particular, the anti-nuclear movement lacked either organisational resources dating back to the Chernobyl mobilisation cycle or sufficient support for their anti-nuclear mobilisation on the streets after Fukushima. In Spain, the absence of organisational resources was exacerbated by having to confront a Socialist government that was moderately anti-nuclear and pledged a phase-out of nuclear energy, alongside the clearly pro-nuclear position of the largest opposition party (the Popular Party).

Thus, another pattern that emerges from our findings is that policy challengers are only able to seize the window of opportunity that a critical event brings when the policy issue was prominent on the agenda prior to the shock, and they can deploy pre-existing organisational resources and mobilisation experience to mount a credible challenge. This would suggest that the two-step process of mobilisation and policy change that we proposed (Figure 1) shows promise and should be more systematically assessed in future research.

Conclusions

We have examined conditions under which a critical event triggers large-scale public discussion and mobilisation, and whether the instigated discussion and mobilisation facilitate a policy change. We argued that both large-scale mobilisation and policy change require a set of favourable political opportunities. Past scholarship suggested that these conditions are essential in accounting for the anti-nuclear movement's capacity to seize the opportunity that a nuclear accident brings to get their anti-nuclear message across (Kitschelt 1986; Koopmans and Duyvendak 1995). By adopting a theory-development process-tracing approach, we analysed nuclear energy debates and policy courses after Fukushima as an illustrative case of the dynamics of interest, employing a comparative dataset of 12 established democracies.

In line with theoretical expectations, the data suggest that both intense anti-nuclear mobilisation and subsequent policy change happened only where the situation was 'ripe'.

Indeed, the nuclear accident in Fukushima did not trigger large-scale public debates about nuclear energy, large-scale anti-nuclear mobilisation, or policy changes in most countries under examination. However, all three coalesced in Germany, Italy, and Switzerland, where intense and heavily attended anti-nuclear protests were amplified by widespread anti-nuclear views among the general public as well as among some major (national and regional) political allies. In Italy and Germany, there was also considerable anti-nuclear sentiment prior to Fukushima. In these two countries, the anti-nuclear movement efficiently ‘used’ the window of opportunity presented by the nuclear accident to mobilise the public and to persuade their respective governments to discard nuclear energy. In Switzerland, however, the anti-nuclear movement had first to win over the general public (pro-nuclear before Fukushima) and only then was it able to press the government into agreeing to a phase-out that marked a substantial policy change.

In the remaining nine countries political opportunities were less favourable, and there was limited anti-nuclear mobilisation. While anti-nuclear protests occurred in France, Spain, and Finland, they attracted considerably lower turnout; protesters there were also less able to forge alliances with major political parties and the general public than in Italy, Germany, and Switzerland, and no substantial policy change ensued. Hence, our study suggests the need to re-examine Kitschelt’s (1986) argument that the size and extent of anti-nuclear protests do not affect the likelihood of policy change. After a critical event, and under the right conditions, the intensity and following of protests seems to have a critical impact on short-term policy changes.

Our study builds on previous comparative work on the interaction between anti-nuclear movements and political elites that highlighted key factors but hesitated to formulate general patterns to long-term nuclear energy policy outcomes (Midttun and Rucht 1994; Thurner, Müller and Schulze 2017) and to political responses to the anti-nuclear movement (Flam 1994c). We move forward this debate by focusing instead on short-term episodes or junctures of policy-making around nuclear energy and by identifying a set of common features that seem to account well for the anti-nuclear movement’s mobilisation success and its impact on short-term policy change after a critical event. Slicing the study of policy responses into shorter periods enables a more detailed consideration of the various interactions between political opportunities and actors’ strategies and seems a promising avenue for future research.

Our descriptive analysis confirms the importance of critical events for boosting movement mobilisation and public anti-nuclear sentiments. Yet external shocks alone are not sufficient to trigger policy change. Instead, our study suggests a reformulation of the likely effects of critical events to make them conditional on favourable opportunities that are best understood as developing in two (analytical) steps: *Critical events are more likely to trigger policy change when intense (contentious) mobilisation from policy challengers aligns with the views of the general public and with the backing of major political allies; and critical events are more likely to trigger intense (contentious) mobilisation when policy challengers can articulate their opposition around pre-existing policy debates on the issue and can resort to pre-existing organisational and mobilisation resources.* These hypotheses should be tested in future research employing systematic theory-testing qualitative or quantitative methods.

The policy area we focused on — nuclear energy — is characterised by critical events that are dramatic and potentially devastating. However, not all shocks that affect policy debates — whether environmental or otherwise — are as dramatic and devastating as nuclear accidents. Thus, while we know that policies are shaped by the lessons extracted from disasters (Birkland 2006), it is an open question as to whether our finding (that protest magnitude seems to matter when combined with other favourable political opportunities) is generalisable across policy issues. Environmental issues are not often particularly salient and exciting *per se*, but critical events can turn them into issues that are both obtrusive and specific.

References

- Aarts, K. and Arentsen, M., 2017. Nuclear power and politics in the Netherlands. In: W.C. Müller and P.W. Thurner, eds. *The politics of nuclear energy in Western Europe*. Oxford: Oxford University Press, 215-234.
- Agnone, J., 2007. Amplifying public opinion: The policy impact of the US environmental movement. *Social Forces*, 85, 1593-1620.
- Baumgartner, F.R. and Jones, B.D., 1993. *Agendas and instability in American politics*. Chicago: University of Chicago Press.
- Beach, D. and Pedersen, R.B., 2013. *Process-tracing methods: Foundations and guidelines*. Ann Arbor: University of Michigan Press.
- Bern, M.R. and Winkel, G., 2013. Nuclear reaction to climate change? Comparing discourses on nuclear energy in France and Germany. In: R. Keller and I. Truschkat, eds. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Birkland, T.A., 1997. *After disaster: Agenda setting, public policy, and focusing events*. Washington, D.C.: Georgetown University Press.
- Birkland, T.A., 2006. *Lessons of disaster: Policy change after catastrophic events*. Washington, D.C.: Georgetown University Press.
- Birkland, T.A. and DeYoung, S.E., 2013. Focusing events and policy windows. In: E. Araral Jr, S. Fritzen, M. Howlett, M. Ramesh, and X. Wu, eds. *The Routledge handbook of public policy*. London: Routledge, 175-188.
- Bolsen, T. and Cook, F.L., 2008. Public opinion on energy policy: 1974-2006. *Public Opinion Quarterly*, 72, 361-388.
- Bratt, D., 2005. Implementing Kyoto in Canada: The role of nuclear power. *The Energy Journal*, 26, 1, 107-121.
- Brouard, S., Gougou, F., Guinaudeau, I., and Persico, S., 2013. Les Français et le nucléaire pendant la campagne présidentielle 2012. In: O. Duhamel and E. Lecerf, eds. *L'état de l'opinion 2013*. Paris: TNS Sofres.
- Brouard, S. and Guinaudeau I., 2014. Policy beyond politics? Public opinion, party politics and the French pro-nuclear energy policy. *Journal of Public Policy*, 35(1), 137-170.
- Burstein, P. and Linton, A., 2002. The impact of political parties, interest groups, and social movement organizations on public policy: Some recent evidence and theoretical concerns. *Social Forces*, 81(2), 380-408.
- Carmin, J. and Fagan, A., 2010. Environmental mobilisation and organisations in post-socialist Europe and the former Soviet Union. *Environmental Politics*, 19(5), 689-707.

- Culley, M.R., Ogley-Oliver, E., Carton, A.D., and Street, J.C., 2010. Media framing of proposed nuclear reactors: An analysis of print media. *Journal of Community & Applied Social Psychology*, 20, 497-512.
- Demoscope, 2010. *Neueste Umfrageresultate zur Kernenergie - Klare Mehrheit hält Kernkraftwerke für sicher: Zustimmung zu Neubau*, available at: http://www.swissnuclear.ch/upload/cms/user/20100129_MM_Eckwertstudie_d.pdf.
- De Groot, J.I.M. and Steg, L., 2010. Morality and nuclear energy: Perceptions of risks and benefits, personal norms, and willingness to take action related to nuclear energy. *Risk Analysis*, 30, 1363-1373.
- Duffy, R., 2011. Déjà vu all over again: Climate change and the prospects for a nuclear power renaissance. *Environmental Politics*, 20(5), 668-686.
- Eiser, J.R., Spears, R., and Webley, P., 1989. Nuclear attitudes before and after Chernobyl: Change and judgement. *Journal of Applied Social Psychology*, 19, 689-700.
- Eurobarometer, 2011. *Special Eurobarometer 364*, available at: http://ec.europa.eu/public_opinion/archives/ebs/ebs_364_en.pdf.
- Eurobarometer, 2009. *Special Eurobarometer 324*, available at: http://ec.europa.eu/energy/nuclear/safety/doc/2010_eurobarometer_safety.pdf.
- Flam, H., ed., 1994a. *States and Anti-Nuclear Movements*. Edinburgh: Edinburgh University Press.
- Flam, H., 1994b. A Theoretical Framework for the Study of Encounters between States and Anti-nuclear Movements. In: H. Flam, ed. *States and Anti-Nuclear Movements*. Edinburgh: Edinburgh University Press, 9-26.
- Flam, H., 1994c. Political Responses to the Anti-nuclear Challenge: (1) Standard Deliberative and Decision-making Settings. In: H. Flam, ed. *States and Anti-Nuclear Movements*. Edinburgh: Edinburgh University Press, 298-328.
- Franchino, F., 2014. The social bases of nuclear energy policies in Europe: Ideology, proximity, belief updating and attitudes to risk. *European Journal of Political Research*, 53(2), 213-233.
- Fried, J. and Eyles, J., 2011. Welcome waste – Interpreting narratives of radioactive waste disposal in two small towns in Ontario, Canada. *Journal of Risk Research*, 14(9), 1017-1037.
- George, A.L. and Bennett A., 2005. *Case Studies and Theory Development in the Social Sciences*. Cambridge: MIT Press.

- Gillion, D., 2012. Protest and congressional behavior: Assessing racial and ethnic minority protests in the district. *The Journal of Politics*, 74(4), 950-962.
- Giugni, M., 2004. *Social protest and policy change: Ecology, antinuclear, and peace movements in comparative perspective*. Lanham: Rowman & Littlefield.
- Giugni, M., 2007. Useless protest? A time-series analysis of the policy outcomes of ecology, antinuclear, and peace movements in the United States, 1977-1995. *Mobilization: An International Quarterly*, 12(1), 53-77.
- Ho, M.S., 2014. The Fukushima effect: Explaining the resurgence of the anti-nuclear movement in Taiwan. *Environmental Politics*, 23(6), 965-983.
- Hobolt, S.B. and Klemmensen, R., 2008. Government responsiveness and political competition in comparative perspective. *Comparative Political Studies*, 41, 309-337.
- Gallup Politics, 2010. *U.S. Support for Nuclear Power Climbs to New High of 62%*, available at: <http://www.gallup.com/poll/126827/support-nuclear-power-climbs-new-high.aspx>.
- Gamson W.A., 1988. Political discourse and collective action. *International Social Movement Research*, 1.2, 219-244.
- Ipsos, 2011. *Global citizen reaction to the Fukushima nuclear plant disaster*, available at: <http://www.ipsos-mori.com/Assets/Docs/Polls/ipsos-global-advisor-nuclear-power-june-2011.pdf>.
- Ipsos Reid, 2010. *Canadian nuclear association: Issues tracking report*, available at: <http://www.cna.ca/wp-content/uploads/Tracking-Report-April2010.pdf>.
- Jahn, D. and Korolczuk, S., 2012. German exceptionalism: The end of nuclear energy in Germany! *Environmental Politics*, 21, 159-164.
- Kitschelt, H.P., 1986. Political opportunity structures and political protest: Anti-nuclear movements in four democracies. *British Journal of Political Science*, 16(01), 57-85.
- Kolb, F., 2007. *Protest and opportunities: The political outcomes of social movements*. Frankfurt and New York: Campus Verlag.
- Koopmans R. and Duyvendak, J. W., 1995. The political construction of the nuclear energy issue and its impact on the mobilization of anti-nuclear movements in Western Europe. *Social Problems*, 42, 235-251.
- Kousis, M., della Porta, D., and Jiménez M., 2008. Southern European environmental movements in comparative perspective. *American Behavioral Scientist*, 51(11), 1627-1647.
- Kriesi, H., Koopmans, R., Duyvendak, J.W., and Giugni, M., 1995. *New social movements in Western Europe*. London and New York: Routledge.

- Kriesi, H., 2017. Switzerland. In: W.C. Müller and P.W. Thurner, eds. *The politics of nuclear energy in Western Europe*. Oxford: Oxford University Press, 259-285.
- Krosnick, J.A., 1990. Government policy and citizen passion: A study of issue publics in contemporary America. *Political Behavior*, 12, 59-92.
- Kuklinski, J.H., Metlay, D.S., and Kay, W.D., 1982. Citizen knowledge and choices on the complex issue of nuclear energy. *American Journal of Political Science*, 26, 615-642.
- Lindell, M.K. and Perry, R.W., 1990. Effects of the Chernobyl accident on public perceptions of nuclear plant accident risks. *Risk Analysis*, 10, 393-399.
- Latré, E., Perko, T., and Thijssen, P., 2017. Public opinion change after the Fukushima nuclear accident: The role of national context revisited. *Energy Policy*, 104, 124-133.
- Lühiste, M., Morales, L., Bernardi, L., Bischof, D., Sabaté, O., and Visconti, F., 2017. ResponsiveGov's Codebook and Appendices, Harvard Dataverse, V1, available at: <http://dx.doi.org/10.7910/DVN/PINCO4> UNF:6:wIfV9HEyxkYtEGXMcITAdQ==.
- McAdam, D., 1996. Political opportunities: Conceptual origins, current problems, future directions. In: D. McAdam, J. McCarthy, and M. Zald, eds. *Comparative perspectives on social movements*. New York: Cambridge University Press, 23-40.
- Manza, J., Cook, F.L., and Page, B. (Eds.), 2002. *Navigating public opinion: Polls, policy, and the future of American democracy*. New York: Oxford University Press.
- Meyer, D.S., 2004. Protest and political opportunities. *Annual Review of Sociology*, 30, 125-145.
- Meyer, D.S., and Staggenborg, S., 1996. Movements, countermovements, and the structure of political opportunity. *American Journal of Sociology*, 101(6), 1628-1660.
- Meyer, M. and Schoen, H., 2017. Avoiding vote loss by changing policy positions: The Fukushima disaster, party responses, and the German electorate. *Party Politics*, 23(4), 424-436.
- Midttun, A. and Rucht, D., 1994. Comparing Policy Outcomes of Conflicts over Nuclear Power: Description and Explanation. In: H. Flam, ed. *States and Anti-Nuclear Movements*. Edinburgh: Edinburgh University Press, 383-415.
- Müller W.C. and Thurner, P.W., eds., 2017. *The politics of nuclear energy in Western Europe*. Oxford: Oxford University Press.
- Nohrstedt, D., 2009. Do advocacy coalitions matter? Crisis and change in Swedish nuclear energy policy. *Journal of Public Administration Research and Theory*, 20, 2, 309-333.
- Page, B., 1978. *Choices and echoes in presidential elections: Rational man and electoral democracy*. Chicago: University of Chicago Press.

- Page, B. and Shapiro, R.Y., 1983. Effects of public opinion on policy. *American Political Science Review*, 77, 175-190.
- Pidgeon, N.F., Lorenzoni, I., and Poortinga, W., 2008. Climate change or nuclear power—No thanks! A quantitative study of public perceptions and risk framing in Britain. *Global Environmental Change*, 18, 69-85.
- Plutzer, E., Maney, A., and O'Connor, R.E., 1998. Ideology and elites' perception of the safety of new technologies. *American Journal of Political Science*, 42, 190-209.
- Rothman, S. and Lichter, S.R. 1987. Elite ideology and risk perception in nuclear energy policy. *American Political Science Review*, 81, 383-404.
- Sabatier, P. and Jenkins-Smith, H., 1999. The advocacy coalition framework: An assessment. In: P. Sabatier, ed. *Theories of the Policy Process*. Boulder, CO: Westview, XX-XX.
- Siegrist, M. and Visschers V.H.M., 2013. Acceptance of nuclear power: The Fukushima effect. *Energy Policy*, 59, 112-119.
- Siegrist, M., Sütterlin, B., and Keller, C., 2014. Why have some people changed their attitudes toward nuclear power after the accident in Fukushima? *Energy Policy*, 69, 356-363.
- Soroka, S.N. and Wlezien, C., 2010. *Degrees of democracy. Politics, public opinion, and policy*. New York: Cambridge University Press.
- Staggenborg, S., 1993. Critical events and the mobilization of the pro-choice movement. *Research in Political Sociology*, 6, 319-345.
- Swyngedouw, M., 2015. Nuclear energy politics in Belgium: Big business and politics. Centre for Sociology (CeSO) - ISPO working paper, KU Leuven.
- Turner, P.W., Müller W.C., and Schulze C., 2017. Conclusion: Explaining Nuclear Policy Reversals. In: W.C. Müller and P.W. Turner, eds. *The politics of nuclear energy in Western Europe*. Oxford: Oxford University Press, 286-360.
- Verplanken, B., 1989. Beliefs, attitudes, and intentions toward nuclear energy before and after Chernobyl in a longitudinal within-subject design. *Environment and Behavior*, 21, 371-392.
- Visschers, V.H.M. and Wallquist, L., 2013. Nuclear power before and after Fukushima: The relations between acceptance, ambivalence and knowledge. *Journal of Environmental Psychology*, 36, 77-86.
- Walsh, E.T., 1981. Resource mobilization and citizen protest in communities around Three Mile Island. *Social Problems*, 29(1), 1-21.

WIN-Gallup, 2011. *Worldwide Barometer of Views on Nuclear Energy after Japan Earthquake*, available at: http://survey.dedicated.be/Tabular_Presentation.pdf.

World Nuclear Association, 2014. *Nuclear Power in Sweden*, available at: <http://www.world-nuclear.org/info/Country-Profiles/Countries-O-S/Sweden/>.

World Nuclear News, 2010. *Majority of Swedes support nuclear energy*, available at: http://www.world-nuclear-news.org/NP-Majority_of_Swedes_support_nuclear_energy-1703105.html.

Figure 1. Two-step approach to the dynamics and processes that unfold after a critical event

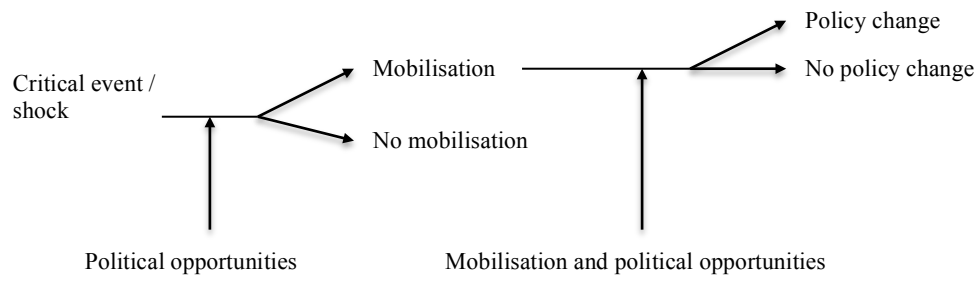
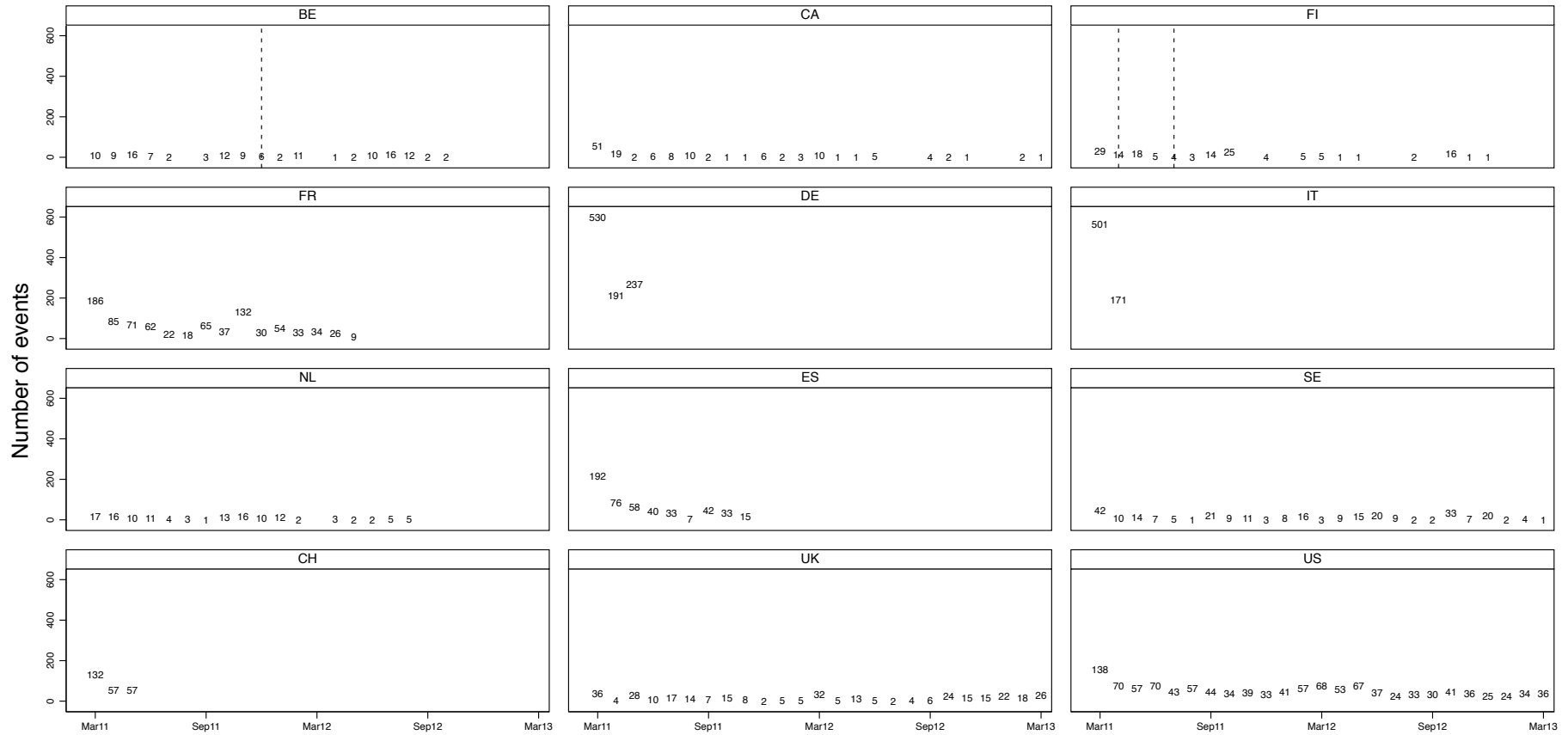
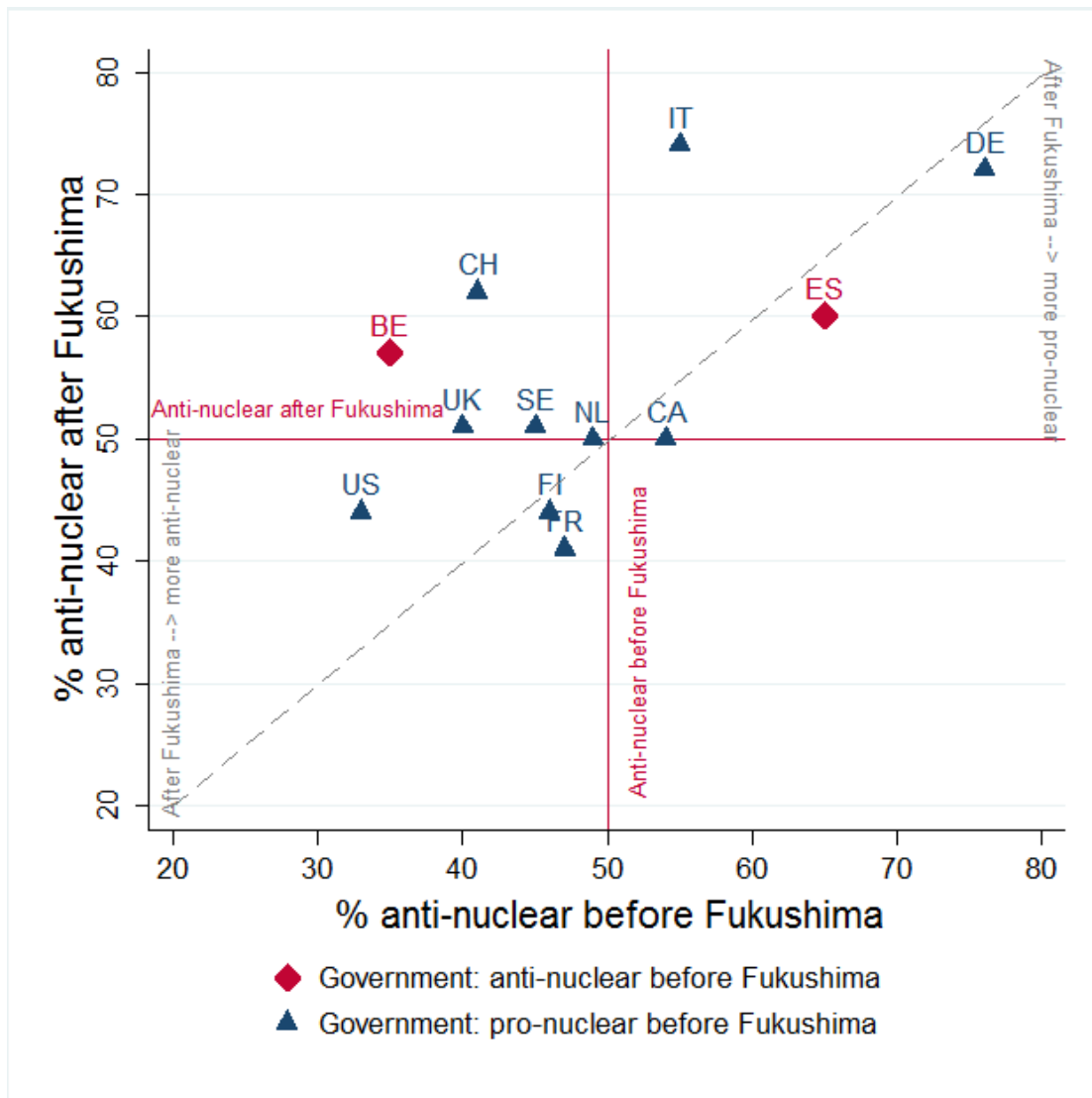


Figure 2. Number of events per month



Note: The numbers indicate how many events (political decisions, statements, surveys, meetings/debates, and protests) occurred each month. The number of time points varies by country because the coding period is different across countries. In Belgium and Finland, there were government changes during the coding period, marked by the vertical lines.

Figure 3. Public rejection of nuclear energy before and after Fukushima (survey results)



Sources: Special Eurobarometer 324 (Sep-Oct, 2009); Demoscope (Jan, 2010); TNS Sifo in World Nuclear News (Feb, 2010); Gallup Politics (Mar, 2010); Ipsos Reid (Apr, 2010); Special Eurobarometer 364 (Feb 2011); WIN-Gallup (Apr, 2011); Ipsos (Jun, 2011).

Figure 4. The share of anti- and pro-nuclear positions expressed in all events by different actors (entire time period)

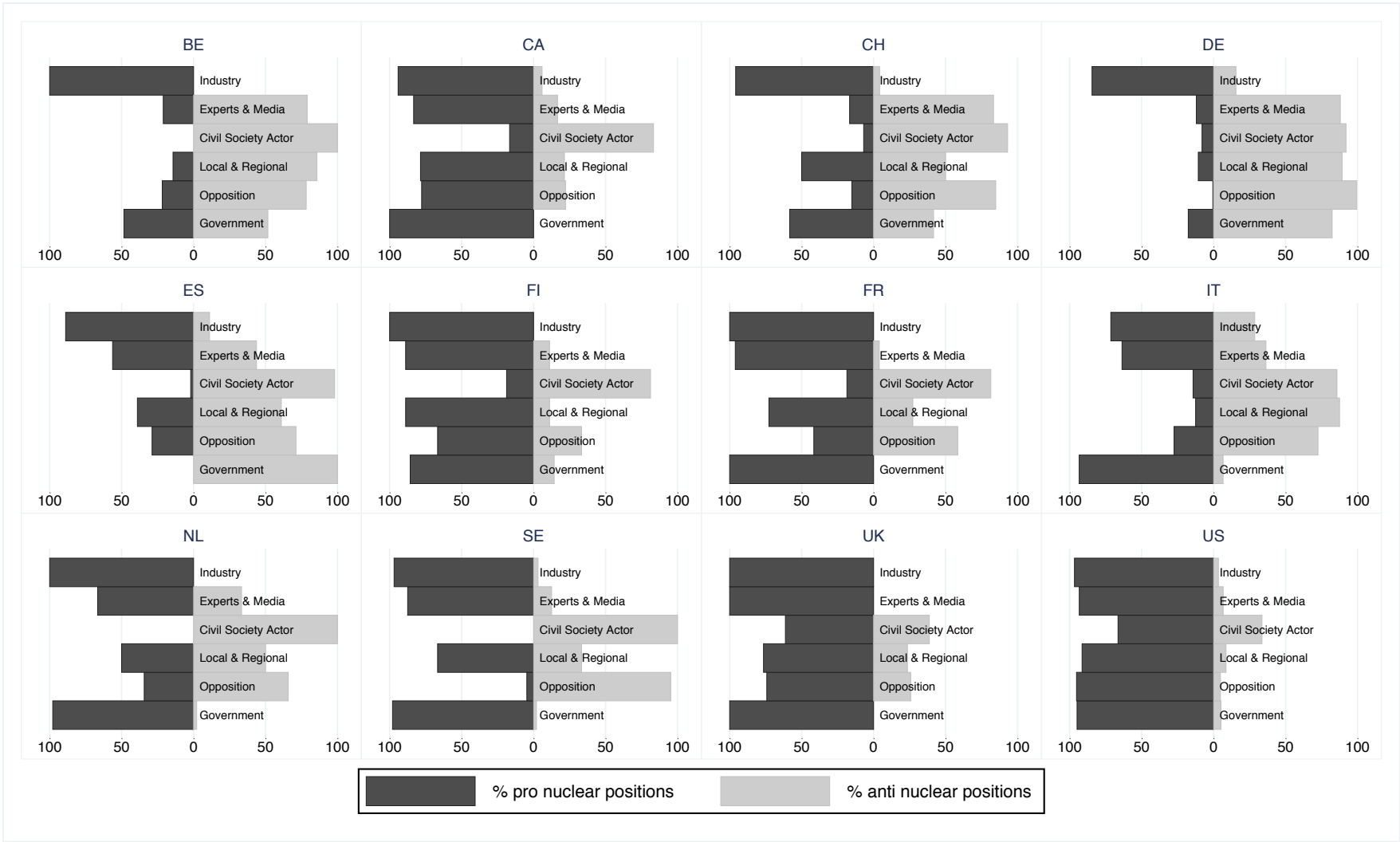


Figure 5. Share of anti- and pro-nuclear actions by political parties (by week until June 2011)

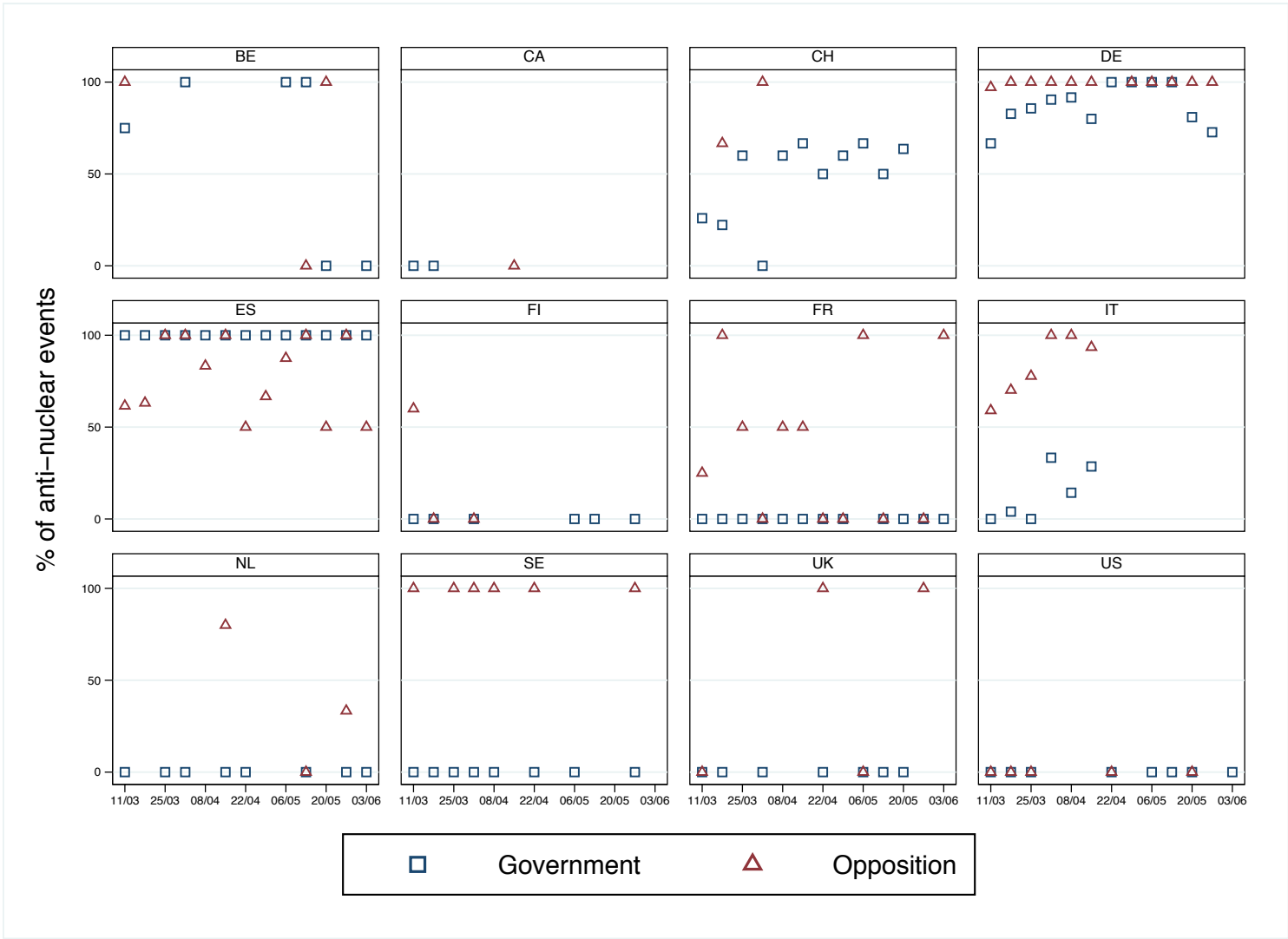


Table 1. Nuclear energy policy positions before and after the Fukushima accident across all countries studied

Country (and Government)	% of nuclear in energy production (2010/2011)	New reactor plans prior to Fukushima?	Phase-out agreed by	Government	Initial position on nuclear energy before Fukushima (or at gov't inauguration for 2nd & 3rd gov'ts)	Final governmental position on nuclear energy after Fukushima
Belgium (1) 2010-2011	51.1%	Moratorium	2025	Caretaker government (<u>CD&V</u>)	-1 (Anti-nuclear)	-1 (Anti-nuclear)
Belgium (2) 2011-2014	54%	Phase-out aborted in 2012		<u>CD&V</u> , PS, MR, CDH (Di Rupo)	-1 (Anti-nuclear)	1 (Pro-nuclear)
Canada	15.1%	2 new reactors planned		<u>CP</u> (Harper)	2 (Very pro-nuclear)	2 (Very pro-nuclear)
Finland (1)	28.4%	1 in construction; 1 planned		<u>KESK</u> , KOK, VIHR, RKP-SFP (Kiviniemi)	1 (Pro-nuclear)	2 (Very pro-nuclear)
Finland (2)	31.6%	1 in construction; 1 planned		Caretaker government (<u>KOK</u>)	2 (Very pro-nuclear)	1 (Pro-nuclear)
Finland (3)	31.6%	1 in construction; 1 planned		<u>KOK</u> , SDP, VIHR, VAS, RKP-SFP, KD (Katainen)	1 (Pro-nuclear)	1 (Pro-nuclear)
France	74.1%	Sarkozy: 40 years extension		<u>UMP</u> , NC (Filion; Sarkozy)	2 (Very pro-nuclear)	1 (Pro-nuclear)
Germany	28.4%	Moratorium	2022	<u>CDU/CSU</u> , FDP (Merkel)	1 (Pro-nuclear)	-2 (Very anti-nuclear)
Italy	None	Moratorium, new reactors debated		<u>PDL</u> , LN, MPA (Berlusconi)	2 (Very pro-nuclear)	-1 (Anti-nuclear)
The Netherlands	3.4%	Building of 1 reactor postponed in 2012		<u>VVD</u> , CDA (Rutte)	2 (Very pro-nuclear)	1 (Pro-nuclear)
Spain	20.1%	Moratorium on new plants. License extensions possible		PSOE (Zapatero)	-1 (Anti-nuclear)	-1 (Anti-nuclear)
Sweden	38.1%	Replacement of existing reactors allowed		<u>MSP</u> , FP, C, Kd (Reinfeldt)	1 (Pro-nuclear)	1 (Pro-nuclear)
Switzerland	38%	Moratorium	2034	SVP-UDC, SP-PS, FDP-PRD, CVP-PDC, BDP (Schneider-Ammann)	2 (Very pro-nuclear)	-1 (Anti-nuclear)
United Kingdom	15.7%	Up to 8 new reactors planned		<u>CON</u> , LD (Cameron)	2 (Very pro-nuclear)	2 (Very pro-nuclear)
United States	19.6%	5 under construction, 6 expected to start operating by 2020		DEM (Obama)	2 (Very pro-nuclear)	2 (Very pro-nuclear)

Source: International Atomic Agency, World Nuclear Association, OECD Nuclear Agency, and ResponsiveGov project coding for the initial and final government positions.

Note: The Premier's party is underlined in the case of a coalition government.

Table 2. Number of protest participants per million inhabitants and number of protest events

	Number of protest events & participants in March-May 2011			Number of protest events & participants (per million inhabitants): entire coding period					
Country	Number of protests	% confrontational protests	Max. number of protesters in any event	Number of protests	% confrontational protests	Max. number of protesters per event	Mean number of protesters per event	Median number of protesters per event	Number of online and offline petitions
IT	19	16%	300,000	19	16%	5,000	634	0.2	0
DE	41	10%	200,000	41	10%	2,500	259	6.3	0
FR	22	14%	26,000	56	20%	962	41	3	4
CH	14	21%	14,500	14	21%	1,750	265	93.8	2
NL	4	0%	5,000	7	29%	313	84	11	1
ES	19	11%	2,000	24	8%	217	19	6.7	1
FI	4	25%	950	8	50%	190	59	35	1
US	6	0%	600	26	0%	3	0.7	0.2	6
UK	1	0%	100	6	50%	16	9	9	1
SE	1	100%	20	3	100%	8	5	5	0
CA	6	83%	20	10	60%	3	0.5	0.1	1
BE	3	33%	1	7	29%	4	2	1.9	1

Note: Countries are ordered by the maximum number of protesters in any single event in the period March-May 2011. In Italy, the number of protest events and protest participants (per million inhabitants) reflects the time period of March-April 2011 only. The computation of the protest variables excludes petitions, which are reported separately. Values in columns 7 to 9 are computed by dividing the maximum, mean, and median number of protesters per event by the country's population size in millions and then multiplied by 1 million. Coding period: starting date common to all countries (11 March 2011); ending dates are: Belgium (31 March 2013), Canada (31 March 2013), Finland (31 March 2013), France (6 May 2012), Germany (30 May 2011), Italy (20 April 2011), the Netherlands (12 September 2012), Spain (20 November 2011), Sweden (31 March 2013), Switzerland (25 May 2011), the United Kingdom (31 March 2013), and the United States (31 March 2013).

Table 3. The configuration of political opportunities before and after the Fukushima nuclear accident and the policy outcomes

3A: Before Fukushima

	IT	DE	CH	BE	ES	NL	SE	FR	CA	FI	UK	US
Anti-nuclear position by gov't before Fukushima				x	x							
Large anti-nuclear sentiment	x	x			x							
Large-scale anti-nuclear protests	x	x	x									
Siding of political allies with anti-nuclear protestors	x	x		x	x	x			x	+		
Ongoing policy change debate	x	x	x	x	x							

3B: After Fukushima

	IT	DE	CH	BE	ES	NL	SE	FR	CA	FI	UK	US
Large anti-nuclear sentiment	x	x	x	x	x							
Large-scale anti-nuclear protests	x	x	x					+				
Siding of political allies with anti-nuclear protestors	x	x	x	x	x	+	x	+				
Limited nuclear industry countermobilisation	x			x	+	x						
Anti-nuclear position by gov't after Fukushima	x	x	x		x							
Policy change in anti-nuclear direction after Fukushima	x	x	x									

Notes: x = condition fulfilled; + = condition partly fulfilled; bold = countries in which a policy change happened.

Sources: Kriesi (2017), Aarts and Arentsen (2017), Swyngedouw (2015), Bern and Winkel (2013), and ResponsiveGov project data collection (all information for section 3B of the table).

Online Appendix (not for publication)

“The effects of the Fukushima disaster on nuclear energy debates and policies:
A two-step comparative examination”

Government’s initial and final policy position

For each country, we determine the initial policy positions by assigning a score for each government on an ordinal scale from -2 (very anti-nuclear) to +2 (very pro-nuclear) depending on the governments’ position, as expressed in the coalition agreement (for coalition governments) or in party manifestos (for single party governments) for the elections prior to the Fukushima accident. Category ‘-2’ is assigned to governments that are against any plans of building new power plants and committed to close all existing power stations within the next 10 years. Category ‘-1’ is applied if the government is generally against the building of new power plants and committed to close some or all existing power stations in a more distant future. Category ‘+1’ is used if the government does not intend to close any power stations but also does not plan to build any new ones. Category ‘+2’ is applied if the government has a long-term commitment to nuclear energy, manifested in (the plans to) building new nuclear power stations. For more information on coding categories, see Lühiste et al. (2017).

Actor’s policy position relative to the government’s initial policy position

Each actor’s policy position is coded in relation to the government’s initial policy position. Coders can choose between five categories: an actor’s position is radically more anti-nuclear (-2), slightly more anti-nuclear (-1), the same (0), slightly more pro-nuclear (1), or radically more pro-nuclear (2) than the government’s initial policy position (see Lühiste and Morales 2016 for more information).

Actor's policy position recoded

In order to summarise whether different sets of actors hold anti-nuclear or pro-nuclear views, irrespective of the initial government position, the data are recoded as follows:

- If the government's initial policy position is anti-nuclear (-1), then all actors whose position is coded as -2, -1, or 0 are considered to be anti-nuclear energy and all others as pro-nuclear energy.
- If the government's initial policy position is pro-nuclear (+1), then all actors whose position is coded as 2, 1, or 0 are considered to be pro-nuclear energy and all others as anti-nuclear energy.
- If the government's initial policy position is very pro-nuclear (+2), then only actors whose policy position is coded as -2 are considered to be anti-nuclear energy and all other as pro-nuclear energy.

List of Keywords: English

Nuclear
Nuclear + energy
Fukushima
Daiichi
Radiation+ safety
Atomic + energy
Atomic + power
Radioactive
Nuke + plant
Power plant
Energy + policy
Green + energy
Survey + energy
Survey + Fukushima
Poll + energy
Poll + Fukushima
Protest + energy
Protest + Fukushima
Demonstration + energy
Demonstration + Fukushima
Declaration + energy
Declaration + Fukushima
Claim + energy
Claim + Fukushima
Greenpeace
Expert* + energy
Expert* + Fukushima
Uranium

Instructions: In order to speed up the process of searching for news stories, search for all the keywords at once by separating them with “OR”. See below for the example in English:

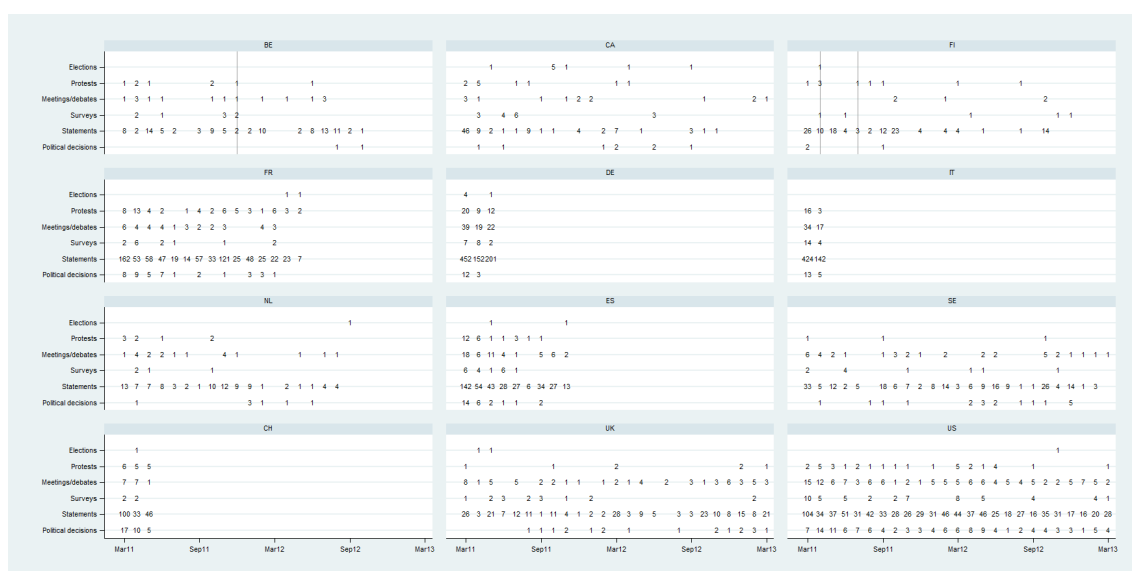
Nuclear OR Fukushima OR Daiichi OR (Radiation AND safety) OR (Atomic AND energy) OR (Atomic AND power) OR Radioactive OR (Nuke AND plant) OR (Power AND plant) OR (Energy AND policy) OR (Green AND energy) OR (Survey AND energy) OR (Survey AND Fukushima) OR (Poll AND energy) OR (Poll AND Fukushima) OR (Protest AND energy) OR (Protest AND Fukushima) OR (Demonstration AND energy) OR (Demonstration AND Fukushima) OR (Declaration AND energy) OR (Declaration AND Fukushima) OR (Claim AND energy) OR (Claim AND Fukushima) OR Greenpeace OR (Expert* AND energy) OR (Expert* AND Fukushima) OR Uranium

Summary of inter-coder reliability scores

Table A1. Inter-coder reliability scores with 20 events and 19 coders

Var Number	Description of variable	Krippendorff Alpha (method)
v5a; 1	Day of event	0.99 (interval)
v5b; 2	Month of event	0.98 (interval)
v5c; 3	Year of event	1 (interval)
v11; 4	Type of event	0.61 (nominal); 0.75 (nominal, using first digit)
v13e1; 10	Number of participants	0.41 (interval)
v14a; 13	Type of Actor General	0.71 (nominal)
v14b; 14	Type of Actor Specific	0.47 (nominal); 0.75 (nominal) with first digit
v14d; 15, 21	Policy position Relative to Government	0.69 (nominal) 0.80 (if recoded as ordinal)
v14d1; 16	Direction and intensity of Position	0.89 (ordinal)

Figure A1: Number of events by event type per month



Note: The numbers indicate how many events per type (rows) occurred each month. The vertical lines indicate a change in government.

References

Lühiste, M., Morales, L., Bernardi, L., Bischof, D., Sabaté, O., and Visconti, F., 2017. ResponsiveGov's Codebook and Appendices, Harvard Dataverse, V1, available at: <http://dx.doi.org/10.7910/DVN/PINCO4> UNF:6:wIfV9HEyxkYtEGXMcITAdQ==.